A.D. 1906. MARCH 14. N.º 6184.

WITHERELL'S COMPLETE SPECIFICATION.

DIV. 13.

6184

279
114

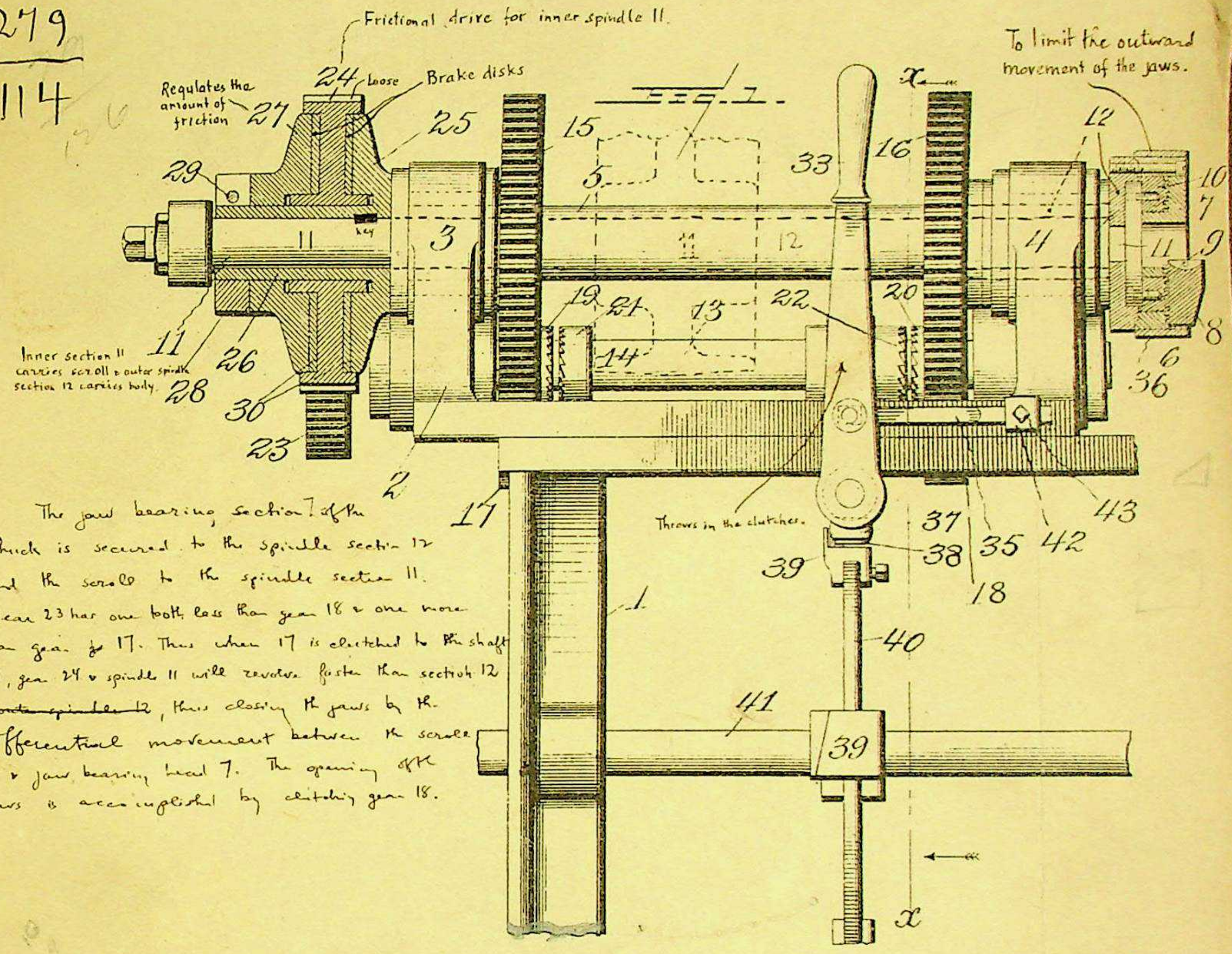
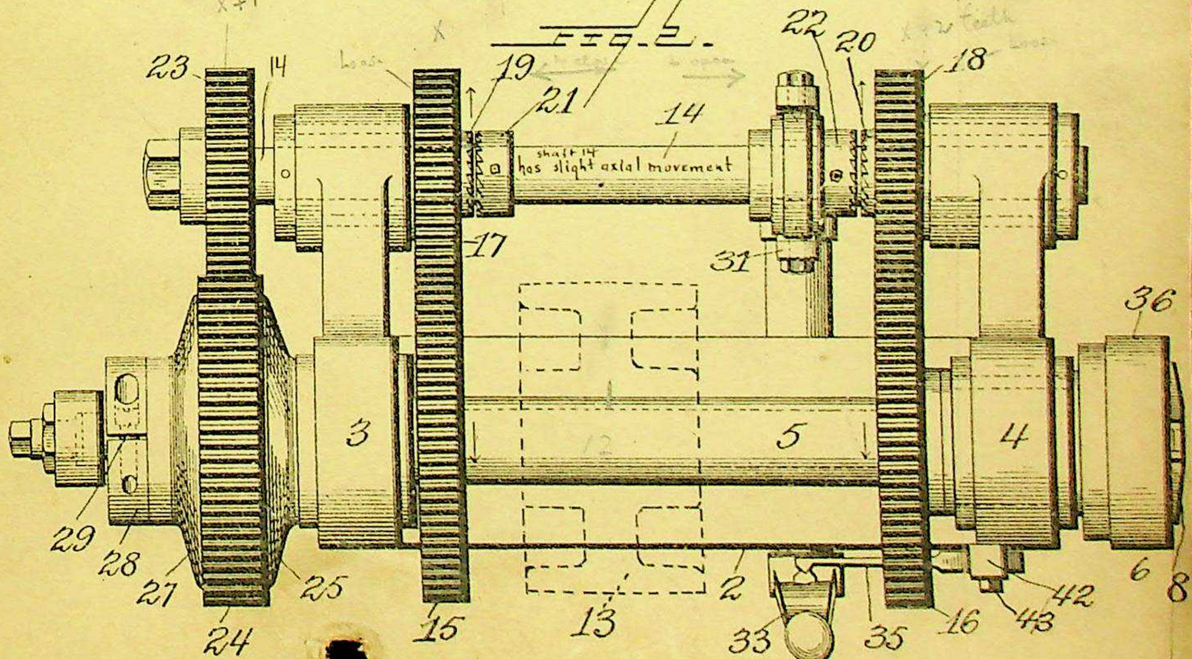


FIG. 1.
Frictional drive for inner spindle 11.
Regulates the amount of friction
24
Loose
Brake disks
27
25
15
29
5
33
16
x
To limit the outward movement of the jaws.
12
10
7
key
11
3
11
12
11
9
8
6
36
19
21
13
22
20
14
Inner section 11 carries scroll & outer spindle section 12 carries body.
11
26
28
30
23
2
17
Throws in the clutches.
37
35
42
43
38
39
18
40
1
41
39
x

The jaw bearing section 7 of the chuck is secured to the spindle section 12 and the scroll to the spindle section 11. Gear 23 has one tooth less than gear 18 & one more than gear ~~[illegible]~~ 17. Thus when 17 is clutched to the shaft 14, gear 24 & spindle 11 will revolve faster than section 12 ~~[illegible] spindle 12~~, thus closing the jaws by the differential movement between the scroll 10 & jaw bearing head 7. The opening of the jaws is accomplished by clutching gear 18.

FIG. 2.



[This Drawing is a reproduction of the Original on a reduced scale.]

A.D. 1906. MARCH 14. N.º 6184.

WITHERELL'S COMPLETE SPECIFICATION.

DIV. 13.

6184

(2 SHEETS)
SHEET 1.

279
114

279-114.

126

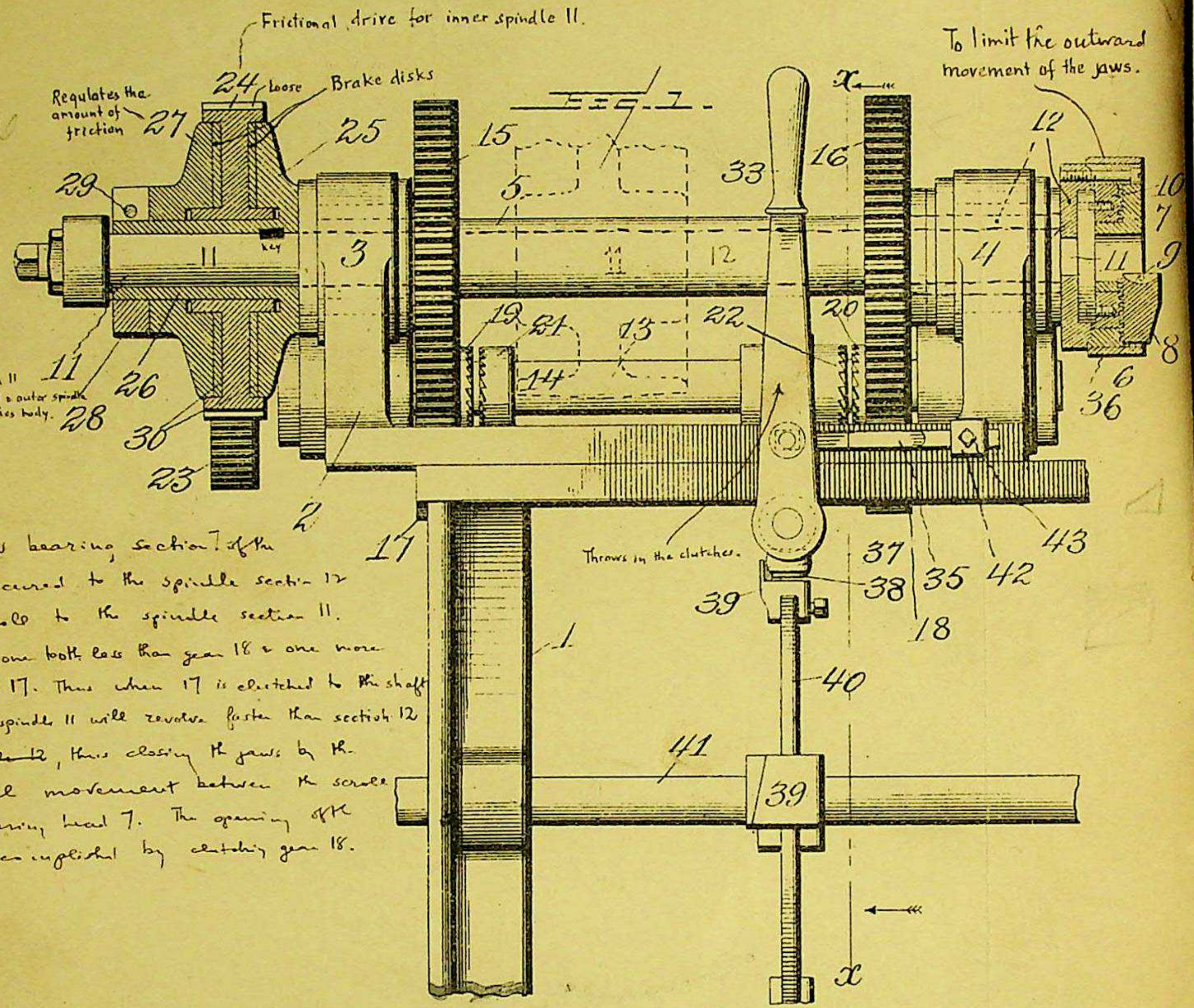
FOREIGN PATENT,
29. METAL WORKING,
Machine Chucks and Tool Sockets.

France - 364557 - 1906

ENGLISH 6184
1906

[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 1.


Frictional drive for inner spindle 11.
Regulates the amount of friction
27
24
Loose
Brake disks
25
29
11
key
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11
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To limit the outward movement of the jaws.
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Inner section 11 carries scroll & outer spindle section 12 carries body.
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2
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Throws in the clutches.
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39
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18
1
40
41
39
x

The jaw bearing section 7 of the chuck is secured to the spindle section 12 and the scroll to the spindle section 11. Gear 23 has one tooth less than gear 18 & one more than gear ~~of~~ 17. Thus when 17 is clutched to the shaft 14, gear 24 & spindle 11 will revolve faster than section 12 ~~outer spindle 12~~, thus closing the jaws by the differential movement between the scroll 10 & jaw bearing head 7. The opening of the jaws is accomplished by clutching gear 18.

FIG. 2.

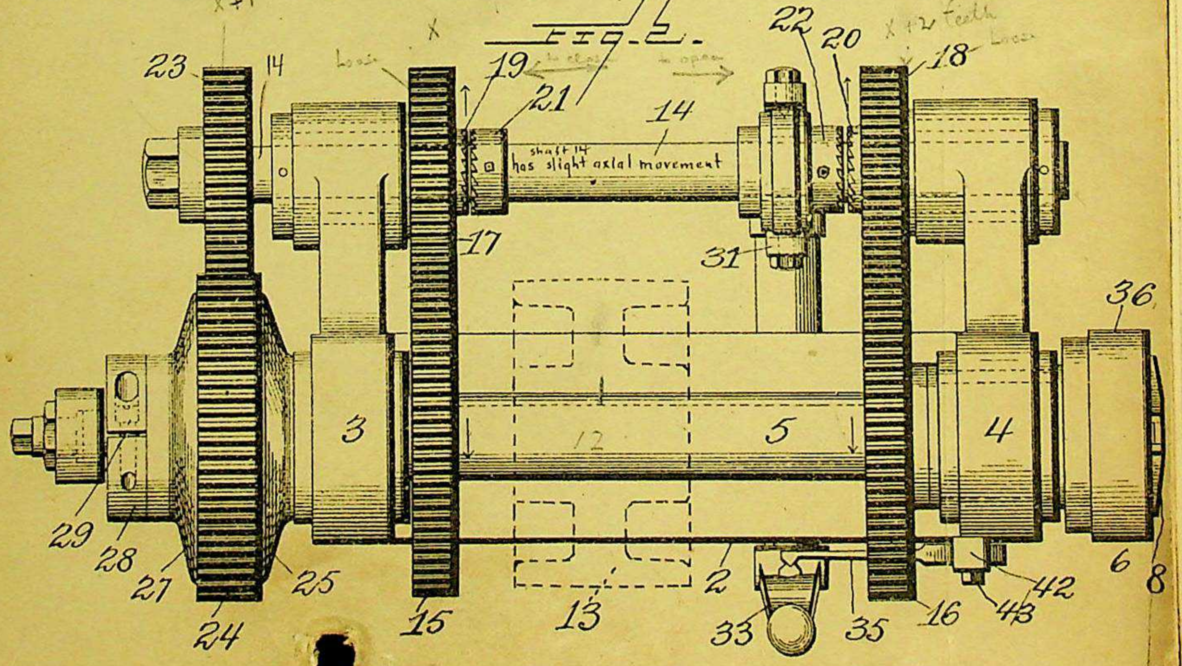
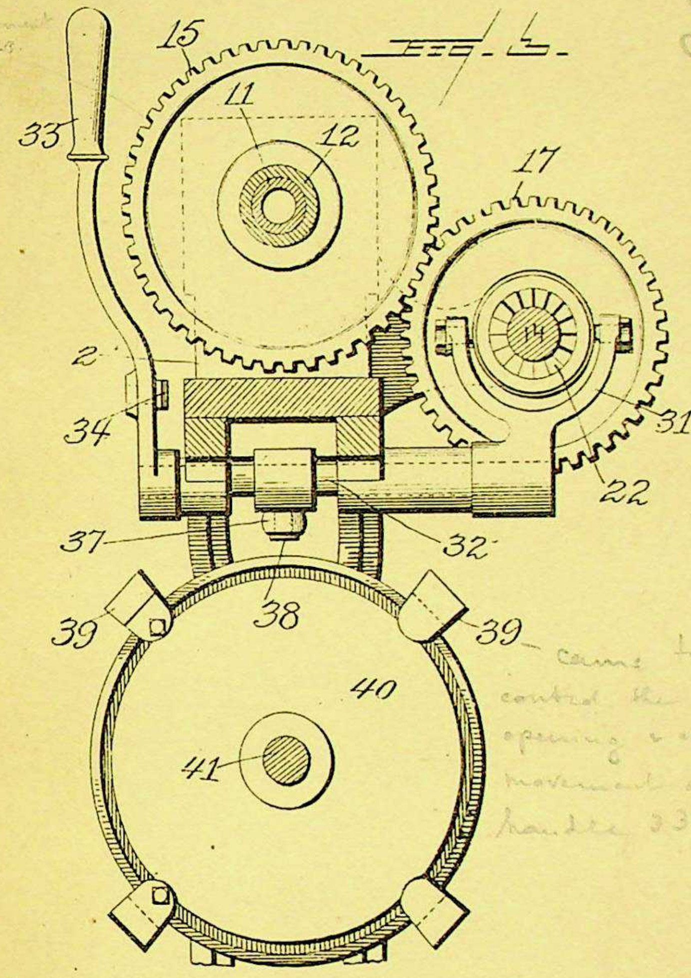


FIG. 3.



cams to control the opening & closing movement of the handle 33.

FIG. 4.

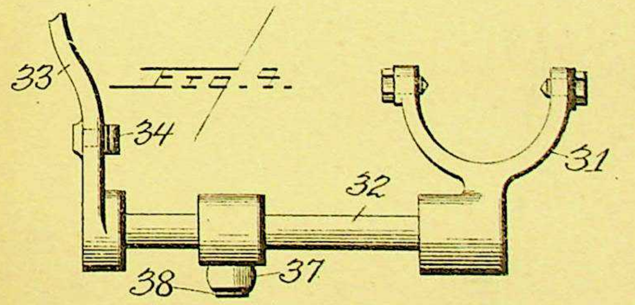
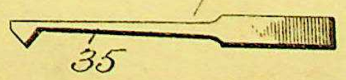


FIG. 5.



A.D. 1906. March 14. N.º 6184.
WITHERELL'S Complete Specification.

DIV 13.

(2 SHEETS)
SHEET 2.

126

FOREIGN PATENT,
29. METAL WORKING,
Mach., Chucks and Tool Sockets.

[This Drawing is a reproduction of the Original on a reduced scale]

FIG. 6.

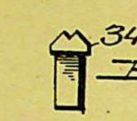


FIG. 7.

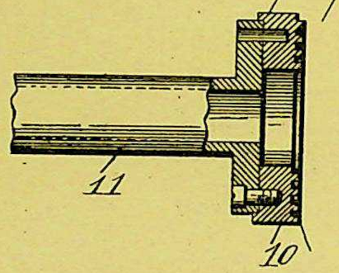


FIG. 8.

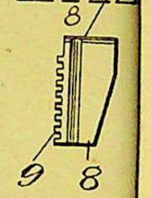


FIG. 9.

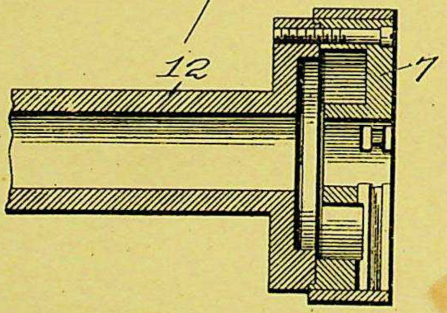


FIG. 10.

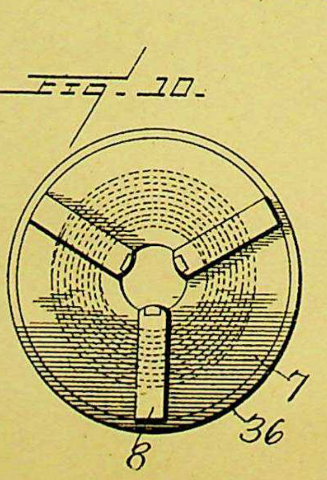


FIG. 11.

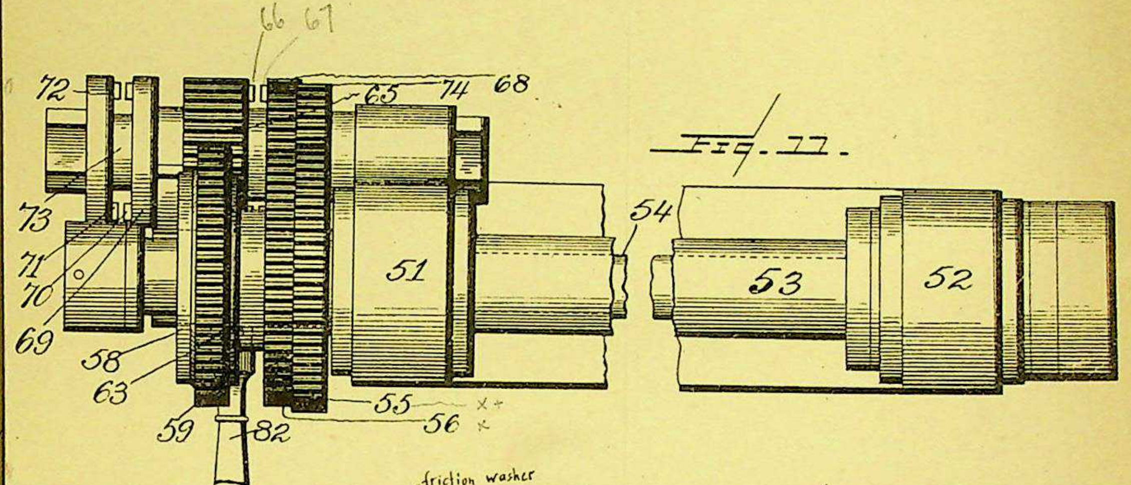


FIG. 12.

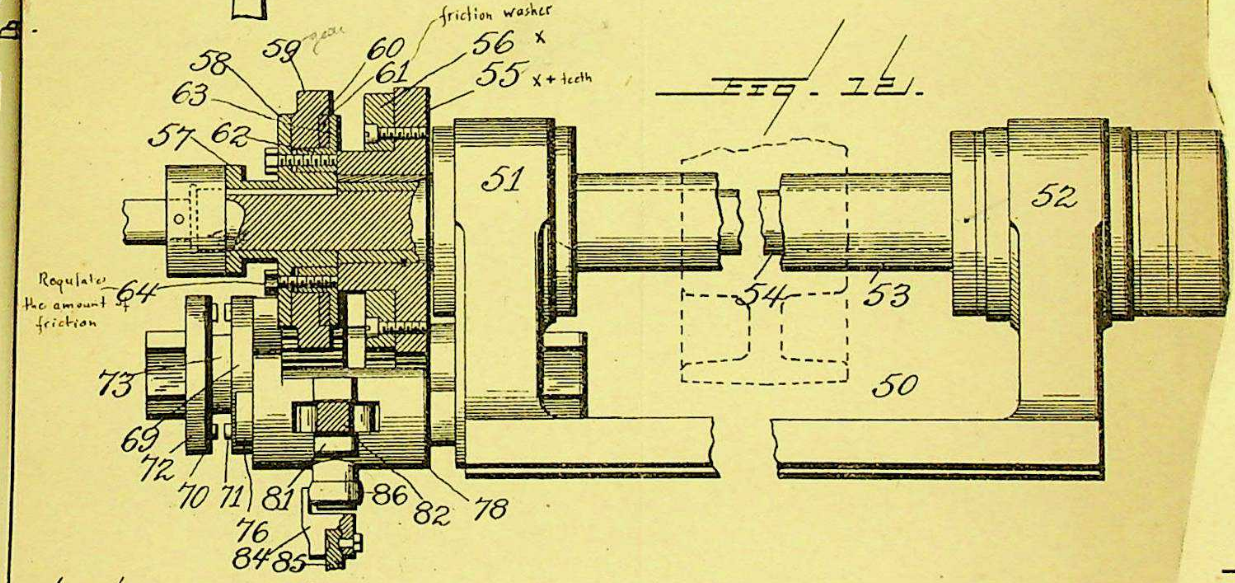


FIG. 13.

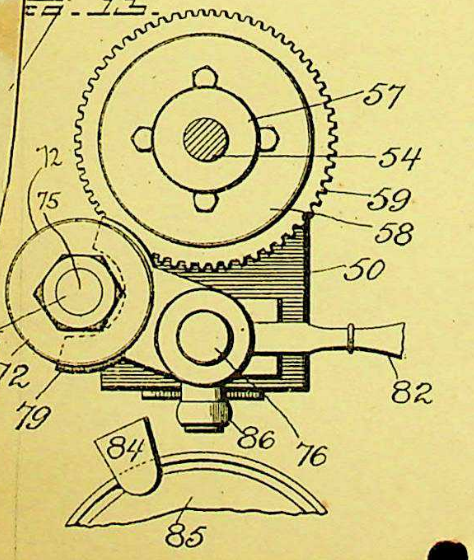


FIG. 14.

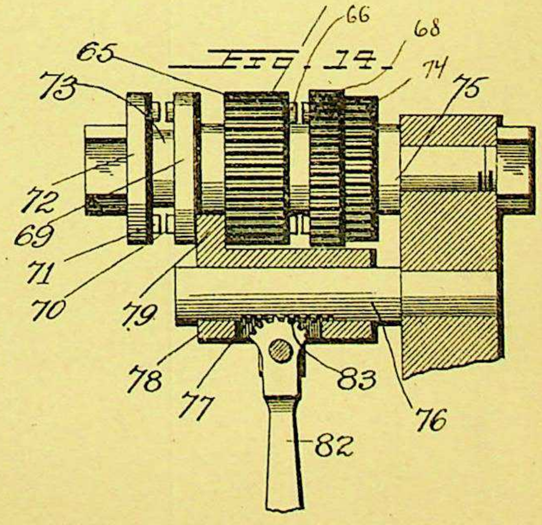


FIG. 15.

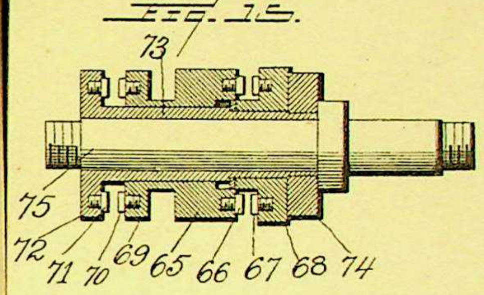


FIG. 16.

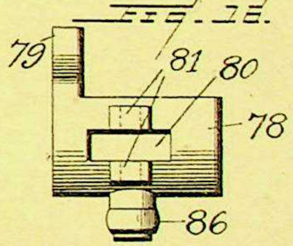
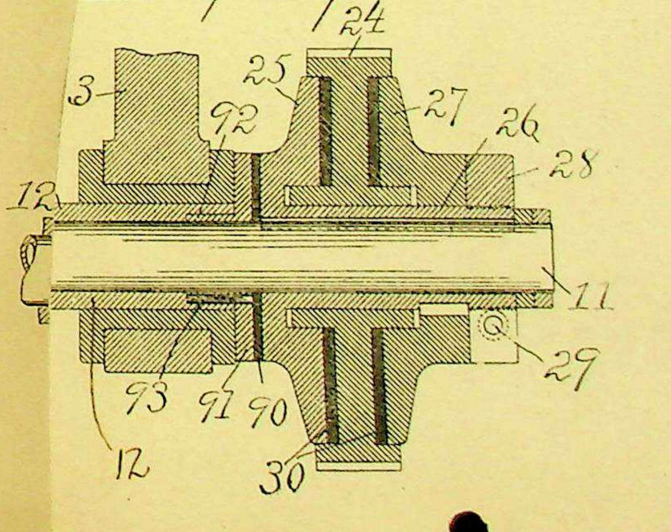


FIG. 17.



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1906

~~414 223 - John - 11/5 - 1889 29 57/[illegible]~~

3037 - 4/10 - 1843 - Perkins et al 29 57/19

Nº 6184 A.D. 1906

Date of Application, 14th Mar., 1906—Accepted, 11th Oct., 1906

COMPLETE SPECIFICATION.

Improvements in and relating to Chucks

I, GEORGE EVERETT WITHERELL, of Hartford, County of Hartford, State of Connecticut, United States of America, Mechanical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement.

My invention relates primarily to chucks, and more particularly to chucks for use in lathes, screw machines or like devices.

The object of the invention is to provide chuck mechanism for actuating the chuck to grasp or release an object while the spindle upon which it is carried is rotated. A further object is to construct such a mechanism that in operation shall not jam or fracture the parts. And a further object is to provide means for frictionally controlling the gripping power of a chuck. A still further object is to provide means in connection with an ordinary scroll for limiting the outward movement of the jaws.

A form of device in the use of which these objects may be attained is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of part of the machine embodying the improvement. Figure 2 is a plan view of the parts shown in Figure 1. Figure 3 is a cross-sectional view on the line *x—x* of Figure 1 looking in the direction indicated by the arrow. Figure 4 is a detail view of the clutch yoke and appurtenant parts. Figure 5 is a plan view of the spring forming part of the detent mechanism. Figure 6 is a view of the lever stud which co-operates with the spring shown in Figure 5. Figure 7 is a detail view of the scroll portion of the chuck, parts being shown in section to better illustrate the construction. Figure 8 is a detail view in side elevation of one of the jaws. Figure 9 is a detail view of the body of the chuck in which the parts shown in Figures 7 and 8 are normally arranged. Figure 10 is a front face view of the chuck showing the arrangement of the jaws and scroll. Figure 11 illustrates a slightly modified form of the device shown in Figures 1 and 2, parts being shown in plan. Figure 12 is a view in side elevation of the parts shown in Figure 11 partially shown in section to better illustrate the construction. Figure 13 is an end view in elevation of the parts shown in Figures 11 and 12 and also the actuating key. Figure 14 is a detail view of the clutch and gear mechanism. Figure 15 is a detail sectional view of the clutches arranged upon the clutch stud. Figure 16 is a detail side view of the clutch yoke and slide. Figure 17 is a detail view in section through the parts shown at the extreme left of Figure 1 and illustrating a device for preventing an opening movement of the chuck jaws when the machine is started at high speed; the parts shown in Figure 17 are turned end for end from the position shown in Figure 1.

As shown in the accompanying drawings the mechanism is mounted in a frame comprising a complete head of suitable form to be applied to the bed of an ordinary screw machine, but, of course, it is obvious that the same elements which are herein shown might be condensed and the whole arranged within a comparatively small space so that the whole structure might be enclosed within a main body which would practically constitute the chuck.

In the accompanying drawings the numeral 1 denotes the base or bed of

[*Price 8d.*]

the machine upon which is suitably mounted a frame 2 which corresponds in arrangement to the head of an ordinary machine. This frame is provided with bearing sections 3—4 for the spindle 5 to which the chuck 6 is secured. The chuck herein shown is of a well-known type known as the scroll chuck and comprises essentially a jaw bearing section 7 having jaws 8 suitably arranged for radial movement in the body part, the jaws being provided with teeth 9 which co-operate with a scroll 10 secured to a sectional spindle 11. The outer body portion of the chuck as herein shown is secured to the outer section of the spindle 12 and this spindle is driven in any suitable manner as by a pulley 13 indicated in dotted outline in Figures 1 and 2. The spindle as already stated is sectional, the inner tubular section 11 being arranged within the outer section 12, one of the parts being secured to the scroll section of the chuck while the other is secured to the main body portion. As this type of chuck is well-known in the art a detailed description is not deemed necessary herein.

Arranged in parallel relation to the main spindle 5 is a countershaft 14 bearing gears which mesh with gears upon the main spindle.

Upon the outer section of the main spindle and fast thereon are two gears 15, 16 meshing with gears 17—18 loosely mounted with relation to the shaft 14. The gear 15 has a greater number of teeth than the gear 16, and, of course, the gears on the countershaft 14 have the required number of teeth to mesh properly with them. Each of the gears 17—18 are provided with clutch members 19—20 by which through co-operating clutch members 21—22, either may be secured to and made to rotate with the shaft 14. This shaft has a slight axial movement and the clutch members 21—22 are fast upon the shaft and move with it to give the required clutching action with respect to the clutch members on the gears. At the outer end of the shaft 14 is a gear 23 which meshes with a wide faced gear 24, the latter arranged to effect a frictional drive between the outer section 12 of the spindle 5 and the inner section 11. The gear 24 is of wide face whereby the shifting movement of the shaft 14 and its gear 23 will always permit proper mesh of the gears 23 and 24. The gear 23 has a smaller number of teeth than the gear 18 and a larger number than the gear 17, and, of course, it is understood that there are corresponding variations in the number of teeth of the gear 24 as compared with the gears 15 and 16.

Upon the outer end of the inner section 11 of the spindle 5 is a disk-like member 25 having an elongated hub 26 upon which the gear 24 is loosely mounted. The member 25 is keyed to the inner spindle section 11. On the opposite side of the gear 24 from the disk 25 is a similar disk-like member 27 which is also mounted upon the hub 26 of the disk 25. This disk 27 is backed up by an adjusting collar 28 having a suitable binding screw 29 by which the relative distance between the two disks 25 and 27 may be adjusted. Intermediate the opposing faces of the disks 25 and 27 and the body portion of the gear 24 are arranged brake disks 30 which may be made of any suitable material as leather or fibre and which are clamped between the disks 25 and 27 and the body portion of the gear 24. It will be seen from this construction that the gear 24 is frictionally bound to the inner section of the spindle and while it will cause the rotation of said section of the spindle when rotated by the co-operating gear 23, it will only rotate said spindle until a certain resistance is applied to retard the rotation of the spindle.

The shaft 14 and the clutch sections 21—22 are moved into and out of engagement with their corresponding clutch members by the yoke 31 secured to a shaft 32 suitably mounted in the frame of the machine and provided with an operating handle 33. This handle has a wedge-shaped stud 34 which co-operates with a detent spring 35 and normally holds the parts in position with both of the clutches out of engagement. As the handle is shifted in either one or the other direction the clutch member 21 or the clutch member 22 will be made to engage its co-operating clutch member 19 or 20 upon the gears 17 and 18 and thus either one of the sets of gears will be connected up with the driving mechanism of the spindle and thus be operated. When either of these gears are thrown in by their respective clutches the shaft 14 is, of course caused to rotate and thus the gears 23 will transmit the rotary movement of the shaft 14 to the gear 24 and the inner member of the spindle.

The gear 23 in ordinary practice of the invention has one tooth more than the gear 17 and one tooth less than the gear 18; thus when the gear 17 is clutched to its shaft the gear 24 and the inner section of the spindle will be revolved at a slightly greater speed than the outer section of the spindle thus closing the jaws of the chuck by the differential movement between the scroll section 10 and the body section 7. In like manner, if the clutch 22 is thrown into engagement the inner section of the spindle will be revolved at a slightly less speed than the outer section and the jaws of the clutch will, therefore, open. It is apparent that both the opening and closing movement of the jaws is thus effected while the spindle is rotating at full speed.

As the gear 24 is frictionally held to the inner spindle member and the power of the friction upon the gear is made adjustable by setting up the plate 27 it follows that the amount of pressure which will be exerted by the jaws on the part upon which they are closed will be determined by the adjustable friction device and when the jaws have once been firmly seated upon the object to be held the gear 24 will of course slip upon the friction device and thus prevent breaking of the parts. It is necessary that some sort of friction mechanism such as described be used in order that the jaws of the chuck may be firmly seated and at the same time prevent breakage of the parts if the operating handle 33 is held in its opening or closing position until the jaws are finally brought together. To prevent the jaws of the chuck being thrown outward to too great an extent a circumferential ring 36 is arranged upon the body of the chuck and limits the outward movement of its jaws. When in the opening operation of the device the jaws abut against this ring the gear 24 will, of course, slip as it does when the jaws are closed upon the object to be held.

While an operating handle 33 is shown the operation of the chuck in its opening and closing movements may be readily controlled by automatic means such as a cam and when so used a roll 37 suitably mounted upon a stud 38 secured to the short shaft 32 is positioned to be moved from one position to another by cams 39 arranged upon a cam plate 40 and rotated at suitable speed upon a shaft 41 which may be driven in any desired manner. The spring detent 35 is for convenience adjustably mounted in a block 42 and secured therein by a set screw 43.

In Figures 11 to 15 inclusive there is shown a slightly modified form of the invention in which all of the several gear mechanisms and operating mechanism for the chuck overhang one end of the support. The principle of operation and the general elements in this case are substantially the same as those heretofore described. In these figures the numeral 50 denotes the support for bearing sections 51—52 in which is supported the spindle composed of two sections, an outer section 53 and an inner section 54. The outer section has mounted upon it and secured thereto a pair of gears 55—56, the former having a greater number of teeth than the latter. Secured to the inner section of the spindle which projects through these gears 55—56 is a sleeve 57 having upon one face a disk 58 against which rests a gear 59. This gear is cut away on one side as at 60 to form a recess within which a friction washer 61 may be arranged. The gear is supported upon a sleeve 62 having a flange 63 resting against the friction washer and co-operating with the flange 58 to exert the desired frictional pressure upon the sides of the gear 59. Adjusting screws 64 determine the amount of pressure exerted by these disks upon the gear. This gear 59 meshes with a gear 65 which has upon one side pins 66 Fig. 15 forming a clutch member to co-operate with pins 67 arranged upon the opposing face of the gear 68 which meshes with the gear 56. On the opposite side of the gear 65 is a pin clutch disk 69 having pins 70 which co-operate with pins 71 in a clutch disk 72. The clutch disk 69 is secured to or formed integral with the gear 65 while the clutch disk 72 is formed upon a sleeve 73 which has secured at its opposite end the gear 74 which meshes with the gear 55. All of the several gears adjacent to the gear 65 and its clutch members are mounted upon a stud 75 directly secured in the supporting frame 50. Operatively arranged with relation to said stud 75 is a second stud 76 Fig. 14 which has on one face a rack 77 and supports a clutch shifting sleeve 78 having a yoke 79 which fits within a recess formed between the clutch disk 69 and the gear 65. This clutch shifting sleeve has an opening 80 Fig 16 and lugs 81 in which there is pivotally supported an operating handle 82 bearing on its inner end a segmental rack 83 in mesh with the rack upon the stud 76. As the handle 82 is moved it is apparent that the gear 65 and its clutch members will be moved into engagement either with the clutch member of the gear 68 or the clutch member of the gear 74. The gear 74 having a less number of teeth than the gear 68 and the gear 65 having a greater number of teeth than one of the gears and a less number than the other gear produces when driving through the gear 59 a differential movement between the inner and outer sections of the spindle thus effecting the opening and closing movements of the chuck dependent upon the position to which the operating handle is thrown. The friction device heretofore described in connection with this modified form operates in exactly the same manner as the friction device described in connection with the preferred form first described and when the jaws are firmly seated upon the piece the gear 59 will slip to prevent breakage of the parts or if the jaws are fully opened it will also slip as soon as the resistance to the movement of the jaws is sufficient to overcome the frictional grasp of the parts upon the gear 59.

In this form of the device the parts may be automatically actuated by a cam 84 Fig 13 mounted upon a cam disk 85 and acting upon a roll 86 carried upon a stud fast to the clutch sleeve 78.

In case cams are used to automatically open and close the chuck it is apparent that there must be one cam for throwing the parts out of normal position, for instance, while the chuck is closing, and another cam for throwing the parts back to normal position when the chuck has been closed. Two cams must likewise be used for throwing the parts from normal position to open the jaws of the chuck and returning them to normal position when the jaws are fully opened.

Obviously numerous changes as to details might be made in the device from what is herein shown and described without departing from the spirit or intent of the invention, and in fact, numerous constructions might be used so long as a differential drive is effected between the two parts of the chuck whereby it may be opened or closed either by hand or automatically without necessitating the reducing of the speed of the spindle and chuck.

It has been found from experiment that in starting up the machine at high speed the considerable weight of the parts of the device located outside of the bearing 3 and including the disks 25 and 27, will cause said parts to lag and not quickly take up the movement of the spindle 5, including the section 12. The slightly faster movement of the spindle 5, while the disks 25 and 27 and gear 24 are gaining their momentum, causes the section 12, which is thus travelling slightly faster than the scroll 10, to, in some instances, open the chuck jaws to a slight degree. In order to obviate such action I interpose a friction disk 90 Fig 17 between the end of the shaft 12 and the hub of the disk 25. In carrying out this idea I preferably provide a plate 91 of a size approximating that of the end of the hub of the disk 25. The end of the shaft 12 is counter-bored to receive a projection 92 from said plate, and a pin 93 projecting through the plate 91 into the end of the shaft 12 may be employed for holding the parts properly secured together.

It is obvious that the improvement including the friction disk 90 for compelling the parts to simultaneously take up the motion of the driving pulley may be easily supplied by any skilled mechanic to the modification shown in Figs. 11 and 12.

I am aware that it has previously been proposed in screwing machines to open and close the dies by a differential rotation of the parts of a sectional spindle driving the screwing head.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is

1. A chuck in which the gripping jaws are opened and closed by the relative rotation of parts of said chuck, in combination with means for differentially rotating said parts, substantially as described.

2. Chuck-mechanism comprising a chuck having jaws moved by the relative rotation of parts of said chuck, trains of gearing each capable of rotating said parts relatively to each other when said chuck is rotating, said trains relatively rotating the said parts in different directions respectively, and clutches whereby said trains of gearing may be thrown into and out of operation.

3. A constructional form of the mechanism claimed in Claim 2, in which the trains of gearing include a common pair of gear-wheels.

4. A constructional form of the mechanism claimed in Claim 2 or in Claim 3 in which the relative rotation of the parts of the chuck in one or both directions is effected through a frictional connection which limits the torque which can be transmitted, for the purposes specified.

5. A constructional form of the mechanism claimed in Claims 2, 3 and 4, in which two parts of the chuck are mounted on concentric spindles, whereof one has two gear-wheels of different sizes fixed thereon and the other has a gear wheel frictionally mounted thereon, these gear-wheels meshing respectively with two loosely-mounted gear-wheels and one rigidly-mounted gear wheel on a countershaft, the said loosely-mounted gear wheels being rotatively connected to or disconnected from the countershaft by means of clutches controlled by hand or automatically by cams.

6. The improved chuck constructed and operating substantially as described with reference to Figures 1 to 10 of the drawings.

7. The modification constructed and operating substantially as described with reference to Figures 11 to 16 of the drawings.

8. The means for preventing lag of the parts 25 and 27 when starting at high speeds, substantially as described with reference to Figure 17 of the drawings.

Dated this 14th day of March, 1906.

D. YOUNG & Co.,
11 & 12 Southampton Buildings, London, W.C.
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1906.